ORDER NO. MTNC010412C1
B1

Service Manual

Color Television

Main Manual
(NA7D)

CT-13R32

CT-13R52

Panasonic

Models	Chassis
CT-13R32E	**DP358**
CT-13R32CE	**DP358**
CT-13R42E	**DP358**
CT-13R42CE	**DP358**
CT-13R52DE	**EP358**

Note: *CT-13R42E/CE are identical to CT-13R32E/CE, respectively, except for cabinet color. (CT-13R42E/CE have white cabinets).*

This Service manual is issued as a service guide for the models of the **NA7D** family listed above. Included are schematics, alignment procedures, disassembly procedures, and a parts list.

"**WARNING!** This Service Manual is designed for experienced repair technicians only and is not designed for use by the general public. It does not contain warnings or cautions to advise non-technical individuals of potential dangers in attempting to service a product. **Products powered by electricity should be serviced or repaired only by experienced professional technicians.** Any attempt to service or repair the product or products dealt with in this Service Manual by anyone else could result in serious injury or death."

The service technician is required to read and follow the "**Safety Precautions**" and "**Important Safety Notice**" in this Manual.

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Service Mode (Electronic Controls)

This Receiver has electronic technology using the I²C Bus Concept. It performs as a control function and it replaces many mechanical controls. Instead of adjusting mechanical controls individually, many of the control functions are now performed by using "On Screen Display Menu". (The **Service Adjustment Mode**.)

Note: *It is suggested that the technician reads all the way through and understand the following procedure for Entering/Exiting the **Service Adjustment Mode**; then proceed with the instructions working with the Receiver. When becoming familiar with the procedure, the Flow Chart for Service Mode may be used as a quick guide.*

Quick Entry to Service Mode:

At times when minor adjustments need to be done to the electronic controls, the method of Entering the service Mode without removal of the cabinet back is as follows using the Remote Control:

1. Adjust VOLUME to minimum (0).
2. Set CC Mode (Close Caption) OFF.
3. Select SET-UP icon and select CABLE mode.
4. Select TIMER icon and set SLEEP time for 30, 60 or 90 Min.
5. Press ACTION button twice to exit menus.
6. Tune to the Channel 124.
7. Press the VOL ◀ button (decrease) **on Receiver**. Red "CHK" appears in the left upper corner.

To toggle between Aging and Service modes:

While the "CHK" is displayed on the left top corner of the CRT, pressing the Action and the Volume Up buttons on the Receiver simultaneously will toggle between the modes. Red "CHK" for Service and yellow "CHK" for Aging.

Note: *Three additional indicators appear on screen. One is the five digit usage in hours and the other two are four digits for V-Chip Main and Child ratings. Indicators are hexadecimal numbers.*

8. **Press** the **Power** Button on the **Remote Control** to select one of six Service Adjustment Modes.
   1. **B**= Service VCJ SUB-DATA adjustments.
   2. **C**= Service VCJ CUT-OFF adjustments.
   3. **P**= Service VCJ adjustments.
   4. **S**= Service OPTIONS (PICTURE) adjustments.
   5. **X** = Service AFC adjustments.
   6. "**CHK**" = Normal operation of CHANNEL ▲▼ and VOLUME ◀ ▶.

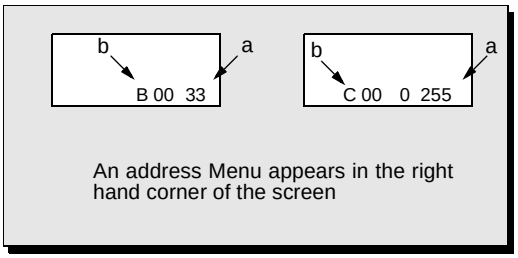


Figure 14. **Service Mode Menu Adjustments.**

Note: *Only the applicable settings for the Receiver serviced will be available (See a in Fig. 14).*

Exiting the Service Mode:

Press the **Action** and the **Power** buttons on the **Receiver** simultaneously for at least 2 seconds.

THE RECEIVER EXITS SERVICE MODE

The Receiver momentarily shuts off; then comes back on tuned to channel 3 with a preset level of sound. Any programmed channels, channels caption data and some others user defined settings will be erased.

IMPORTANT
Always Exit the Service Mode Following Adjustments.

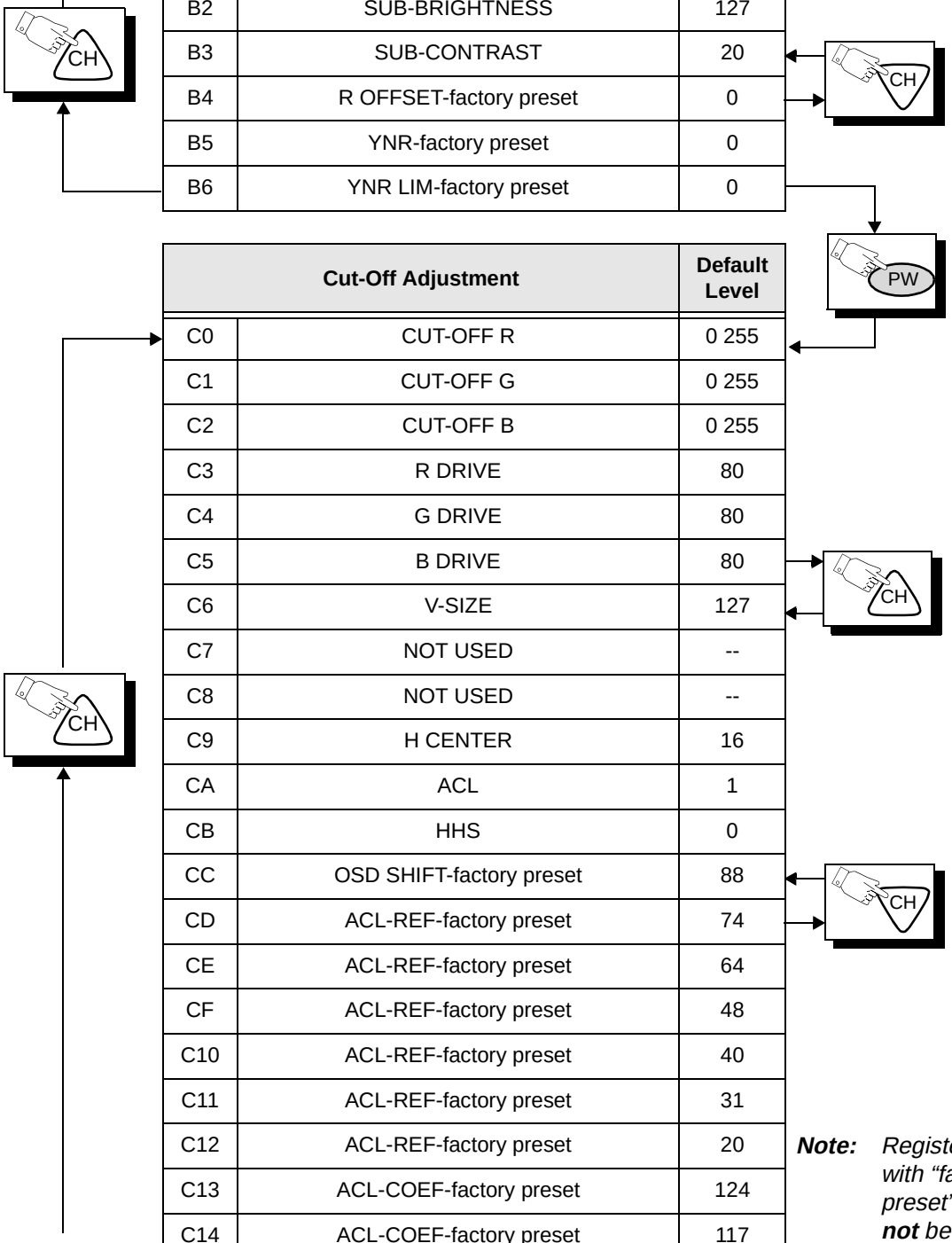
Press the **POWER** Button on the Remote Control to select the Service Adjustment.

For Adjustments:

1. **Press Channel Up/Down** on the **Remote Control** to select one of the available Service Adjustments (**a** in Fig. 14).

Note: *Write Down the original value set (**b** in* Fig. 14*) for each address before modifying anything. It is easy to erroneously adjust the wrong item.*

2. **Press Volume Up/Down** on the **Remote Control** to adjust the level of the selected Service Adjustment (**b** in Fig. 14).

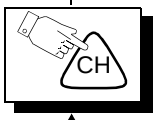


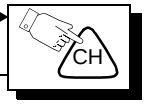
Sub-Data Adjustment		Default Level
B0	SUB-COLOR	33
B1	SUB-TINT	36
B2	SUB-BRIGHTNESS	127
B3	SUB-CONTRAST	20
B4	R OFFSET-factory preset	0
B5	YNR-factory preset	0
B6	YNR LIM-factory preset	0

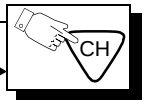
Cut-Off Adjustment		Default Level
C0	CUT-OFF R	0 255
C1	CUT-OFF G	0 255
C2	CUT-OFF B	0 255
C3	R DRIVE	80
C4	G DRIVE	80
C5	B DRIVE	80
C6	V-SIZE	127
C7	NOT USED	--
C8	NOT USED	--
C9	H CENTER	16
CA	ACL	1
CB	HHS	0
CC	OSD SHIFT-factory preset	88
CD	ACL-REF-factory preset	74
CE	ACL-REF-factory preset	64
CF	ACL-REF-factory preset	48
C10	ACL-REF-factory preset	40
C11	ACL-REF-factory preset	31
C12	ACL-REF-factory preset	20
C13	ACL-COEF-factory preset	124
C14	ACL-COEF-factory preset	117

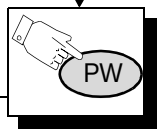
Note: *Registers noted with "factory preset" should **not** be modified.*

Cut-Off Adjustment		Default Level
C15	ACL-COEF-factory preset	94
C16	ACL-COEF-factory preset	80
C17	ACL-WAIT-factory preset	2
C18	ACL-THRESHOLD-factory preset	9
C19	MACROVISION-factory preset	3
C1A	OSD SELECT-factory preset	1
C1B	KILLER ON-factory preset	6
C1C	KILLER OFF-factory preset	20
C1D	KILLER TIME-factory preset	3
C1E	ACC THRESHOLD-factory preset	17
C1F	ACC OFF-factory preset	7
C20	MUTE TIME-factory preset	11

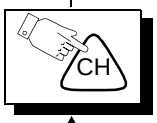


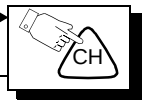


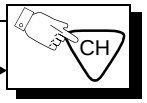


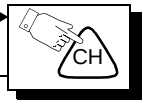


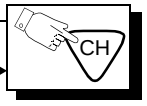
VCJ Adjustment		Default Level
S0	SHARPNESS PW-factory preset	3
S1	SHARPNESS OW-factory preset	3
S2	HALFTONE-factory preset	0
S3	TVC DELAY-factory preset	0
S4	TVY DELAY-factory preset	0
S5	GAMMA FOLDING POINT-factory preset	13
S6	VIDEO Y DELAY-factory preset	0
S7	VIDEO C DELAY-factory preset	0
S8	COMB BPF-factory preset	0
S9	COMB 2D-factory preset	1
SA	COLOR KILLER LEVEL-factory preset	0
SB	KILLER THRESHOLD-factory preset	0
SC	ACC SW-factory preset	0
SD	ACC AMP OFF1-factory preset	100
SE	ACC AMP OFF2-factory preset	0
SF	ACC AMP ON-factory preset	20
S10	ACC AMP CTL-factory preset	3
S11	BGP POSITION-factory preset	21
S12	OSD R-factory preset	30
S13	OSD G-factory preset	30
S14	OSD B-factory preset	30
S15	NOISE KILLER TIME-factory preset	5











Note: *Registers noted with "factory preset" should* ***not*** *be modified.*

VCJ Adjustment (Continued)		Default Level
S16	NOISE KILLER (ACC)-factory preset	50
S17	HV TIMING-factory preset	2

VCJ Adjustment (Black Expansion)		Default Level
P0	FORCE BS-factory preset	1
P1	DET ON/OFF-factory preset	1
P2	ROM SEL-factory preset	3
P3	ROM CURVE-factory preset	2
P4	BS ON/OFF-factory preset	1
P5	BS TIME CONSTANT-factory preset	5
P6	THRESHOLD V-factory preset	4
P7	THRESHOLD F1-factory preset	129
P8	THRESHOLD F1-factory preset	1
P9	THRESHOLD OFF1 (EFFECT OFF)-factory preset	35
PA	THRESHOLD F2-factory preset	99
PB	THRESHOLD F2-factory preset	1
PC	THRESHOLD OFF2 (EFFECT OFF)-factory preset	30
PD	THRESHOLD F3-factory preset	80
PE	THRESHOLD F3-factory preset	1
PF	THRESHOLD OFF3 (EFFECT OFF)-factory preset	21
P10	THRESHOLD ON1-factory preset	37
P11	THRESHOLD ON2-factory preset	33
P12	THRESHOLD ON3-factory preset	25
P13	CURVE1-factory preset	3
P14	CURVE2-factory preset	3
P15	CURVE3-factory preset	3
P16	RATIO1-factory preset	0
P17	RATIO2-factory preset	2
P18	RATIO3-factory preset	3

Note: *Registers noted with "factory preset" should* ***not*** *be modified.*

Other Adjustment		Default Level (Without FM)	Default Level (With FM)
X0	AFCT	60	83
X1	AFCB	29	44
X2	AFCC	42	64
X3	CLOCK	128	128

TO **B** ITEMS

To Check Purity:

When Receiver is in Service Mode (red “CHK” is displayed), place a jumper in the AG connector between the terminals (shorting FB signal to ground). Press the **Recall** Button on the **Remote Control** to enter the White Purity Field Check Mode. Remove the jumper from the AG connector and press **Recall** repeatedly to toggle the Receiver into the Red/Green/Blue Purity Field Check Modes.

Note: if jumper is not removed, colors will be displayed at high luminosity.

In Aging Mode (factory mode, yellow “CHK” is displayed), place a jumper in the AG connector between the terminals. Press **Recall** on the **Remote Control** to enter the Purity Field Check Mode.

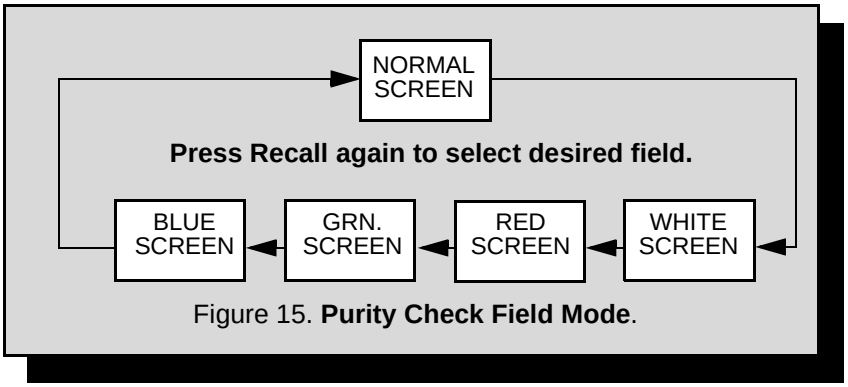


Figure 15. **Purity Check Field Mode**.

Helpful Hints

Entering Service Mode (Back-Open Method)

1. While the Receiver is ON and operating in Normal Mode, momentarily short test point **FA1** (TP8) to Cold Ground (⏚) **FA2** (TP3) A-Board.
   The Receiver enters the Aging Mode.
   Yellow letters “CHK” appear in the upper left corner of the CRT.
   (The Volume Up/Down will adjust rapidly).
2. Simultaneously press the **Action** and the **Volume Up** buttons on the **Receiver** Control Panel.
   The Receiver enters the Service Mode.
   The letter in “CHK” turn red.
   (The Volume Up/Down will adjust normally).
   (All customer controls are set to nominal level).

IMPORTANT
Always Exit the Service Mode Following Adjustments.

Note: *Only applicable settings for the Receiver serviced will be available.*

Instructional Flow Chart for Service Mode

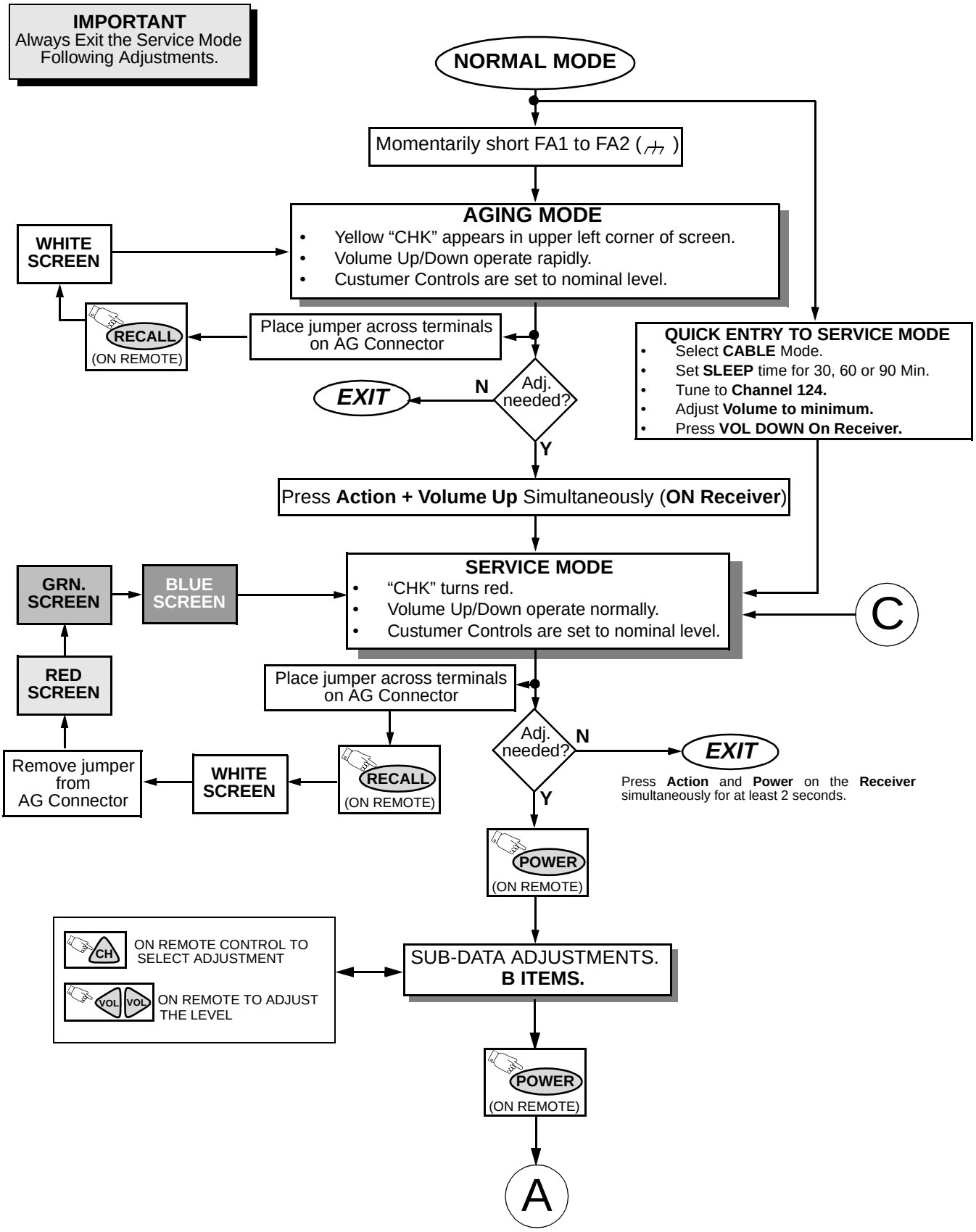
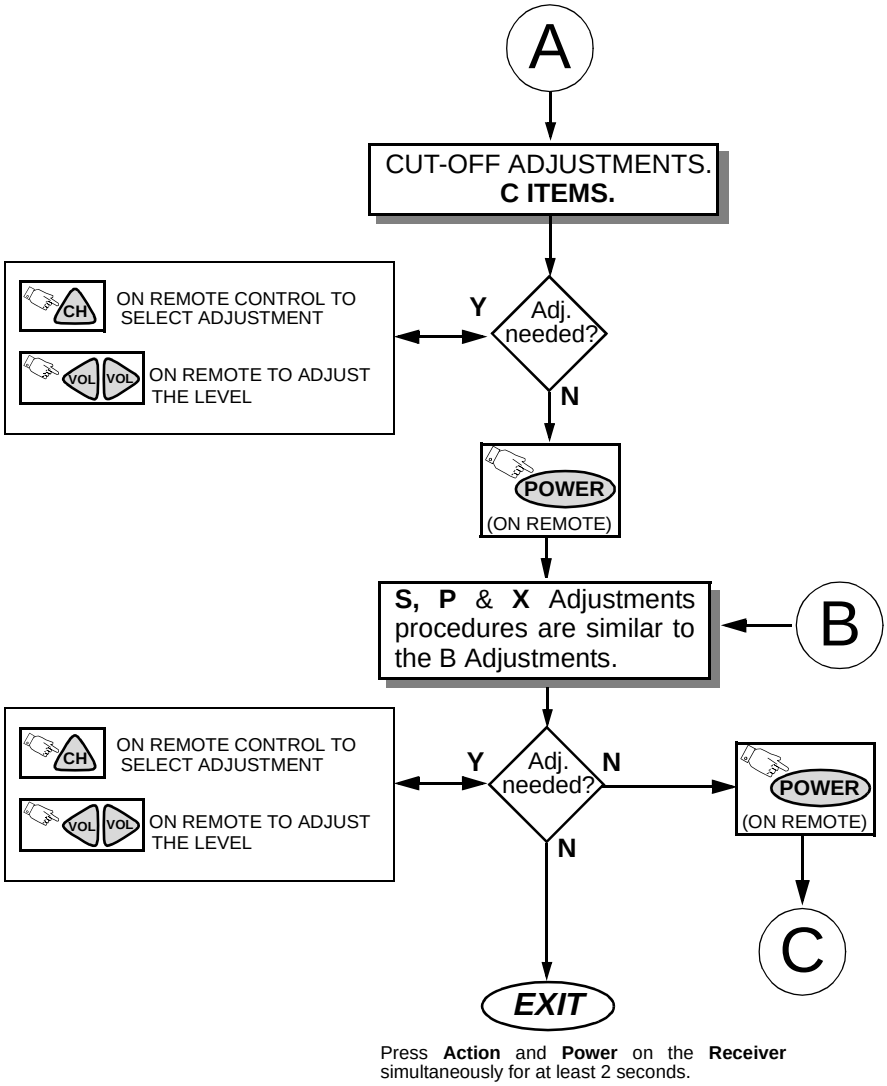


Figure 16. **Flow Chart for Service Mode.**

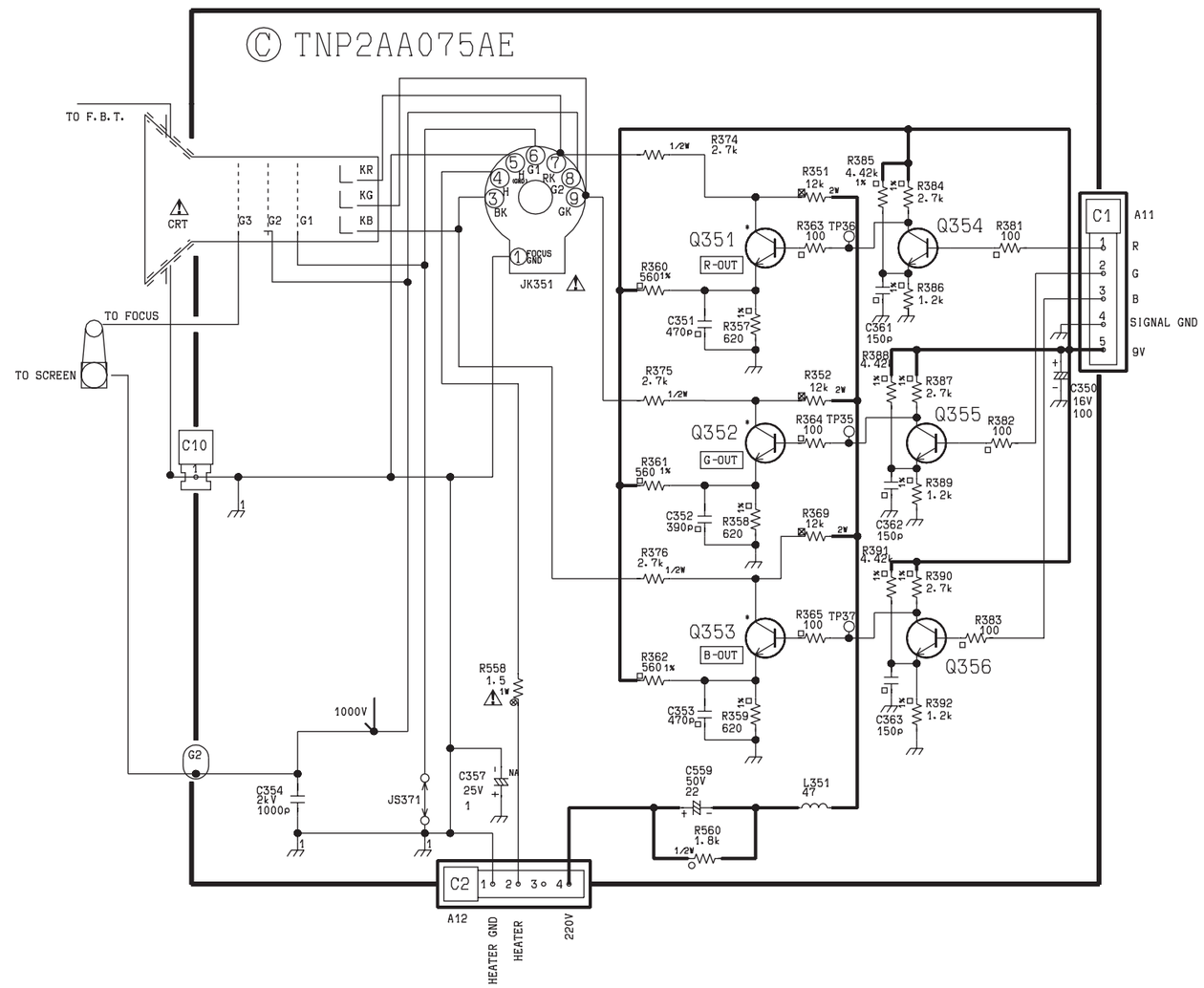


Note: *Only applicable settings for the Receiver serviced will be available.*

IMPORTANT
Always Exit the Service Mode Following Adjustments.

Figure 17. Flow Chart for Service Mode (Cont.)

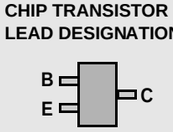
C-BOARD -- TARJETA C
ALL MODELS -- TODOS LOS MODELOS



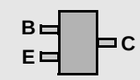
Notes:

- Check Parts List for most recent component values and part numbers.
- Obtain voltages with a digital multimeter.
- The board layouts were modified to enhance and display traces otherwise hidden by a mask.

CHIP TRANSISTOR LEAD DESIGNATION



IDENTIFICACIÓN DE TERMINALES PARA TRANSISTORES EN *CHIP*



	Q351	Q352	Q353
B	6.53	6.39	6.34
C	124.30	129.70	130.50
E	5.99	5.86	5.82

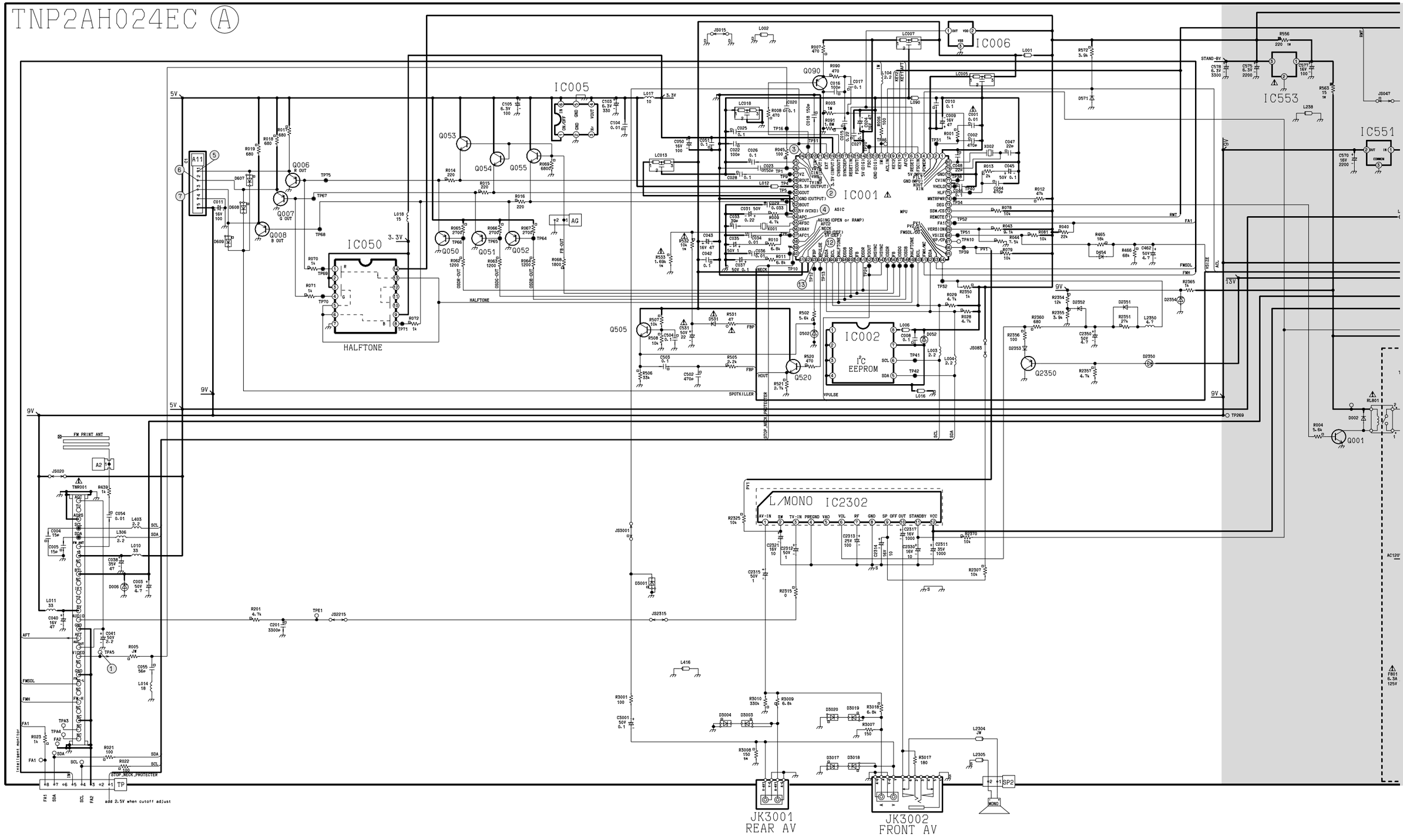
	Q354	Q355	Q356
B	3.90	3.57	3.48
C	6.54	6.50	6.33
E	2.87	2.94	2.90

Notas:

- Verifique los números de parte de los componentes y sus valores en la lista de partes.
- La medición de los voltajes se hizo con un Voltímetro Digital.

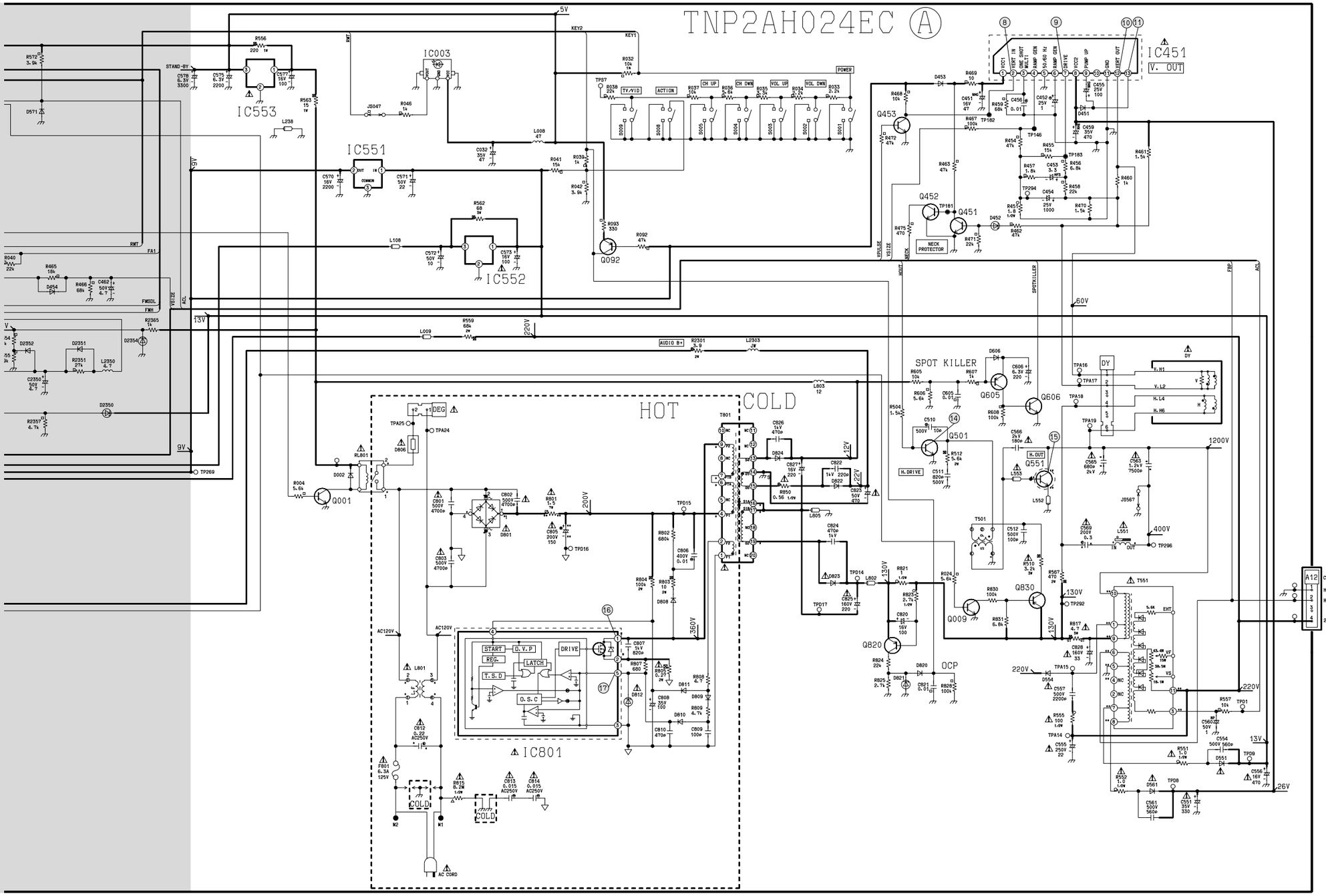
A-BOARD -- TARJETA A
CT-13R32E/CE & CT-13R42E/CE

A-BOARD SCHEMATIC LEFT PORTION -- DIAGRAMA ELÉCTRICO TARJETA A SECCIÓN IZQUIERDA



A-BOARD SCHEMATIC RIGHT PORTION -- DIAGRAMA ELÉCTRICO TARJETA A SECCIÓN DERECHA

A-BOARD -- TARJETA A
CT-13R32E/CE & CT-13R42E/CE



CHIP TRANSISTOR LEAD DESIGNATION

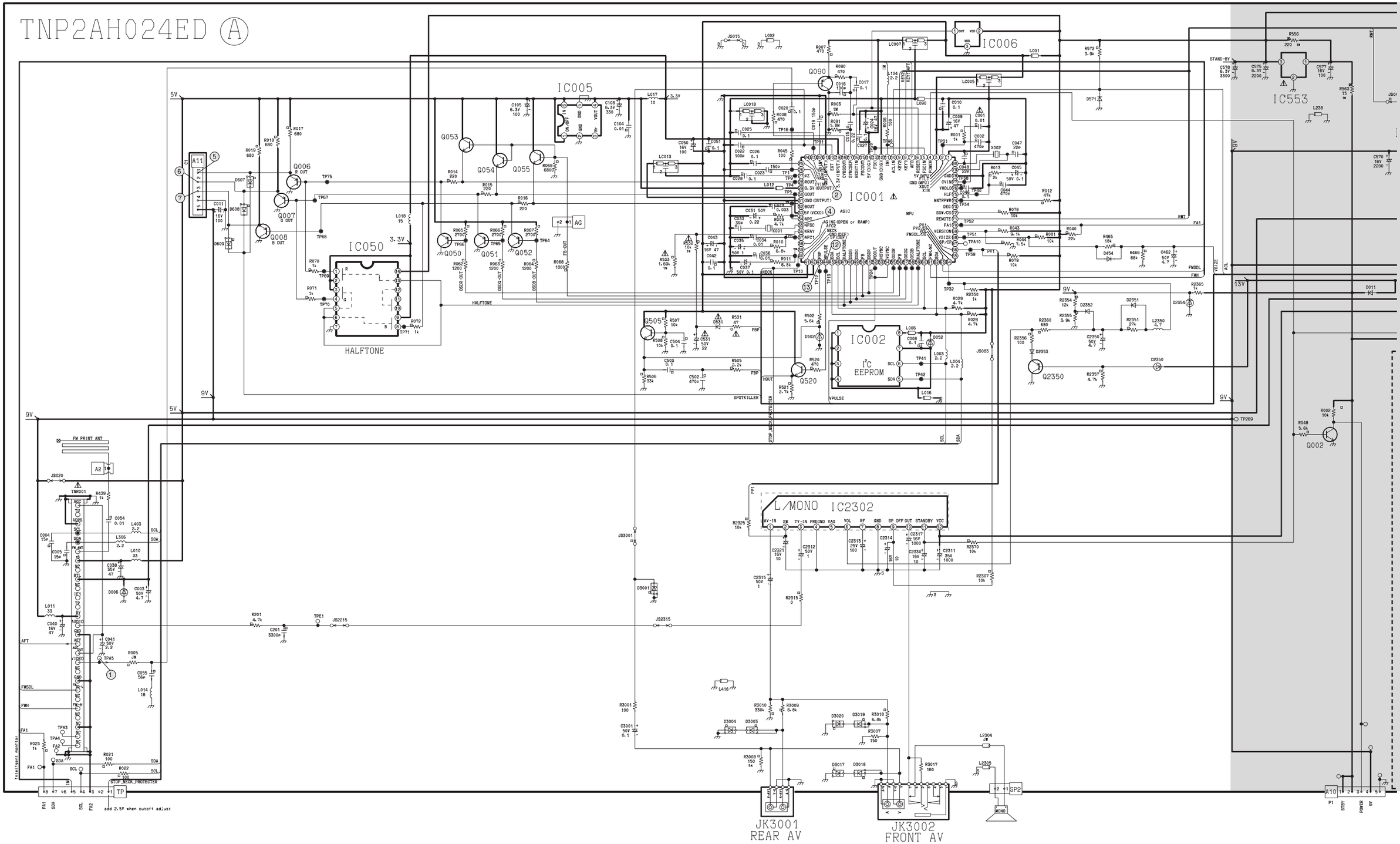
B
E
C

IDENTIFICACIÓN DE TERMINALES PARA TRANSISTORES EN *CHIP*

B
E
C

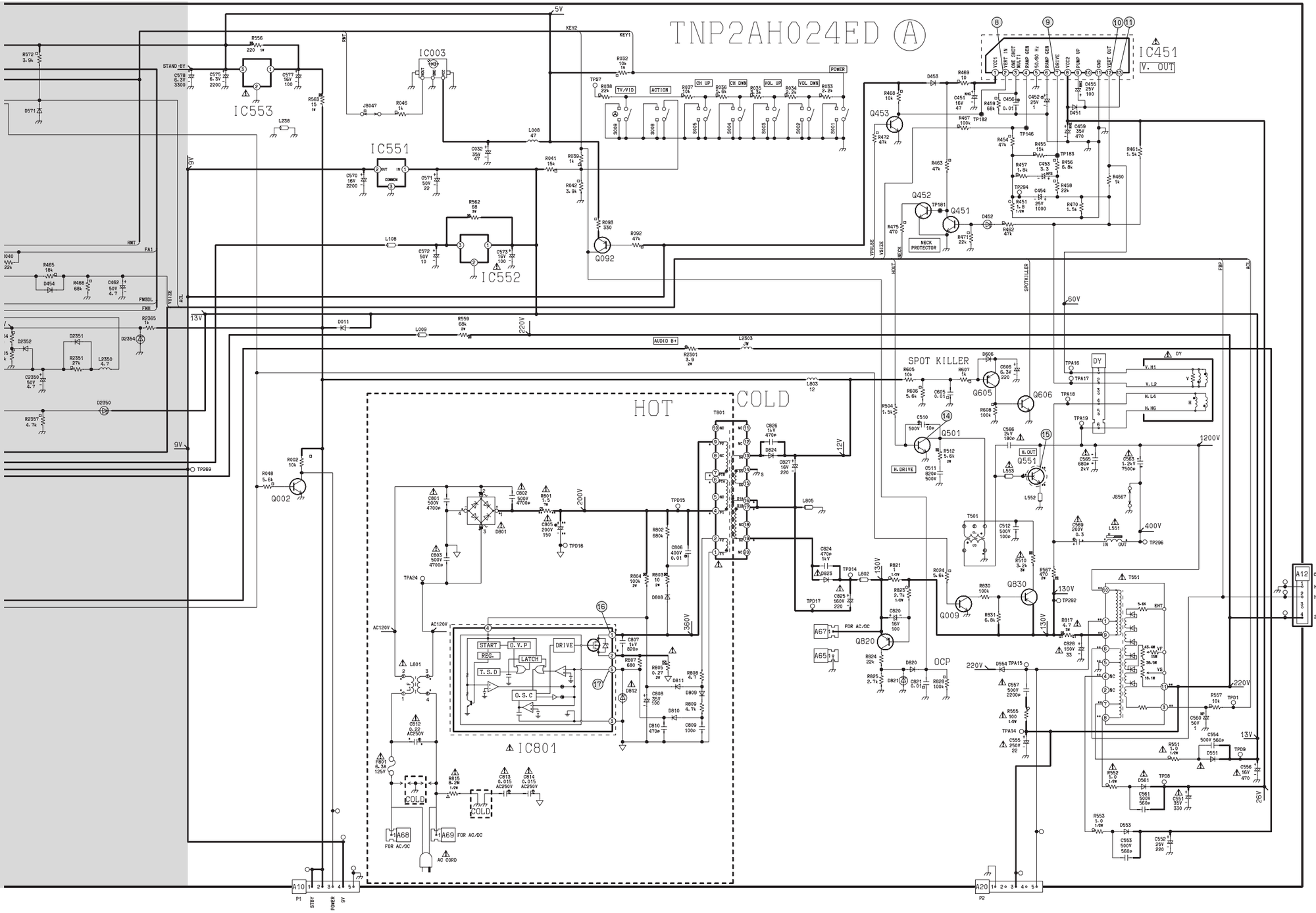
A-BOARD - TARJETA A
CT-13R52DE

A-BOARD SCHEMATIC LEFT PORTION -- DIAGRAMA ELÉCTRICO TARJETA A SECCIÓN IZQUIERDA

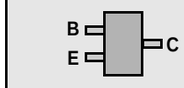


A-BOARD SCHEMATIC RIGHT PORTION -- DIAGRAMA ELÉCTRICO TARJETA A SECCIÓN DERECHA

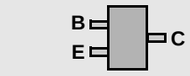
A-BOARD -- TARJETA A
CT-13R52DE



CHIP TRANSISTOR LEAD DESIGNATION



IDENTIFICACIÓN DE TERMINALES PARA TRANSISTORES EN *CHIP*



A-BOARD -- TARJETA A
ALL MODELS -- TODOS LOS MODELOS

A-BOARD VOLTAGES -- VOLTAJES TARJETA A

IC001

1	GND	41	GND
2	1.39	42	4.97
3	4.98	43	2.32
4	4.91	44	1.76
5	2.47	45	4.46
6	4.95	46	4.20
7	2.43	47	0.00
8	4.99	48	4.96
9	2.36	49	4.96
10	2.90	50	0.00
11	4.95	51	4.97
12	GND	52	0.17
13	2.47	53	n.c
14	4.97	54	0.17
15	n.c	55	4.97
16	4.98	56	0.00
17	2.93	57	4.97
18	1.35	58	4.97
19	3.21	59	0.00
20	0.52	60	4.16
21	GND	61	0.00
22	0.62	62	4.45
23	1.69	63	0.00
24	n.c	64	0.39
25	0.45	65	0.00
26	0.95	66	0.00
27	2.06	67	0.00
28	2.59	68	1.94
29	3.26	69	4.98
30	2.69	70	4.98
31	GND	71	4.97
32	2.67	72	4.98
33	4.98	73	0.00
34	2.85	74	4.96
35	2.68	75	1.95
36	2.37	76	0.18
37	2.41	77	2.16
38	n.c	78	GND
39	2.71	79	2.28
40	2.49	80	2.40

IC002

1	GND
2	GND
3	GND
4	GND
5	4.40
6	4.15
7	GND
8	4.99

IC003

1	4.97
2	GND
3	4.98

IC005

1	5.01
2	GND
3	n.c
4	3.26
5	GND
6	5.01

IC006

1	5.00
2	4.98
3	GND

IC050

1	2.59
2	3.20
3	3.21
4	2.69
5	0.00
6	0.00
7	GND
8	2.67
9	3.21
10	n.c
11	n.c
12	n.c
13	0.00
14	4.99

IC451

1	8.18
2	8.66
3	4.10
4	4.15
5	GND
6	3.92
7	3.99
8	24.32
9	1.79
10	n.c
11	GND
12	14.01
13	24.67

IC551

1	12.00
2	8.95
3	GND

IC552

1	12.01
2	GND
3	5.01

IC553

1	8.96
2	GND
3	8.91

IC801

1	187.00
2	0.00
3	GND
4	29.90
5	3.00

IC2302

1	13.58
2	0.00
3	13.62
4	GND
5	n.c
6	2.69
7	16.65
8	GND
9	4.97
10	8.80
11	3.55
12	18.73

	Q001	Q006	Q007	Q008	Q009	Q050	Q051	Q052
B	0.00	2.59	2.68	2.65	0.59	4.98	4.97	4.98
C	11.00	GND	GND	GND	0.00	GND	GND	GND
E	GND	3.24	3.33	3.31	GND	2.59	2.69	2.67

	Q053	Q054	Q055	Q090	Q092	Q451	Q452	Q453
B	0.00	0.00	0.00	1.31	8.92	0.60	0.00	0.00
C	5.00	5.01	5.01	GND	2.37	0.00	2.49	8.66
E	2.59	2.68	2.65	2.04	4.99	GND	GND	GND

	Q501	Q505	Q520	Q551	Q605	Q606	Q820	Q830	Q2350
B	0.36	2.46	1.76	0.00	4.05	0.00	130.30	129.80	6.79
C	85.20	4.98	4.98	-25.30	0.00	3.68	0.00	127.80	GND
E	GND	2.32	1.60	GND	4.01	GND	130.70	130.40	2.35

A-BOARD -- TARJETA A
ALL MODELS -- TODOS LOS MODELOS

A-BOARD VOLTAGES -- VOLTAJES TARJETA A

IC001

1	GND	41	GND
2	1.39	42	4.97
3	4.98	43	2.32
4	4.91	44	1.76
5	2.47	45	4.46
6	4.95	46	4.20
7	2.43	47	0.00
8	4.99	48	4.96
9	2.36	49	4.96
10	2.90	50	0.00
11	4.95	51	4.97
12	GND	52	0.17
13	2.47	53	n.c
14	4.97	54	0.17
15	n.c	55	4.97
16	4.98	56	0.00
17	2.93	57	4.97
18	1.35	58	4.97
19	3.21	59	0.00
20	0.52	60	4.16
21	GND	61	0.00
22	0.62	62	4.45
23	1.69	63	0.00
24	n.c	64	0.39
25	0.45	65	0.00
26	0.95	66	0.00
27	2.06	67	0.00
28	2.59	68	1.94
29	3.26	69	4.98
30	2.69	70	4.98
31	GND	71	4.97
32	2.67	72	4.98
33	4.98	73	0.00
34	2.85	74	4.96
35	2.68	75	1.95
36	2.37	76	0.18
37	2.41	77	2.16
38	n.c	78	GND
39	2.71	79	2.28
40	2.49	80	2.40

IC002

1	GND
2	GND
3	GND
4	GND
5	4.40
6	4.15
7	GND
8	4.99

IC003

1	4.97
2	GND
3	4.98

IC005

1	5.01
2	GND
3	n.c
4	3.26
5	GND
6	5.01

IC006

1	5.00
2	4.98
3	GND

IC050

1	2.59
2	3.20
3	3.21
4	2.69
5	0.00
6	0.00
7	GND
8	2.67
9	3.21
10	n.c
11	n.c
12	n.c
13	0.00
14	4.99

IC451

1	8.18
2	8.66
3	4.10
4	4.15
5	GND
6	3.92
7	3.99
8	24.32
9	1.79
10	n.c
11	GND
12	14.01
13	24.67

IC551

1	12.00
2	8.95
3	GND

IC552

1	12.01
2	GND
3	5.01

IC553

1	8.96
2	GND
3	8.91

IC801

1	187.00
2	0.00
3	GND
4	29.90
5	3.00

IC2302

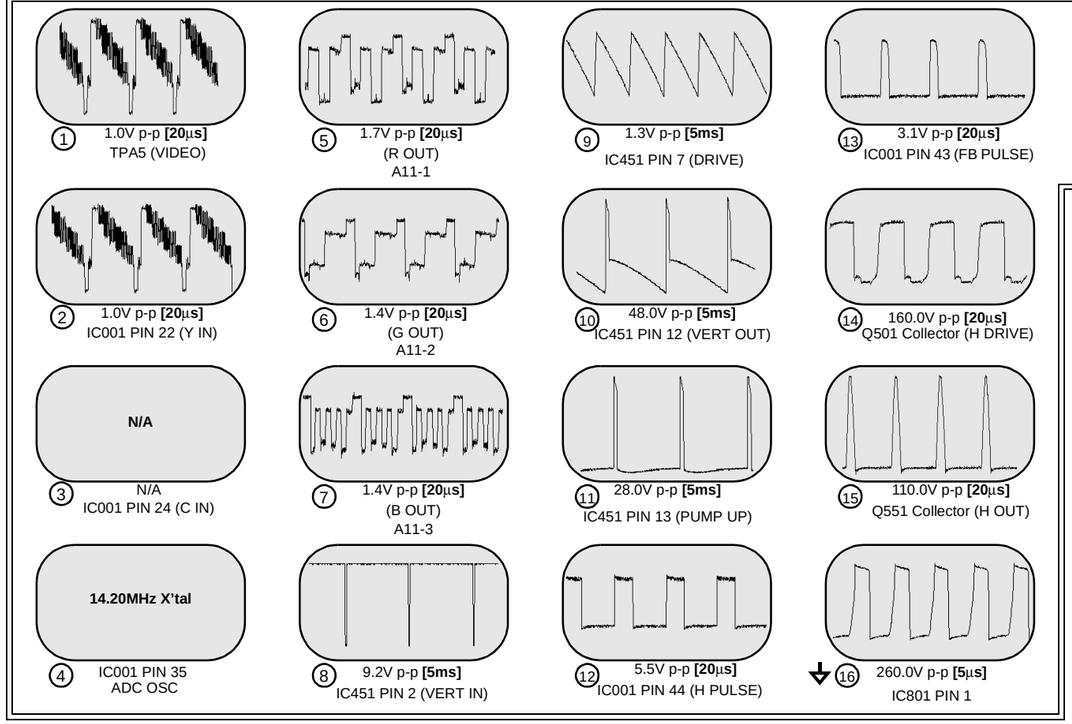
1	13.58
2	0.00
3	13.62
4	GND
5	n.c
6	2.69
7	16.65
8	GND
9	4.97
10	8.80
11	3.55
12	18.73

	Q001	Q006	Q007	Q008	Q009	Q050	Q051	Q052
B	0.00	2.59	2.68	2.65	0.59	4.98	4.97	4.98
C	11.00	GND	GND	GND	0.00	GND	GND	GND
E	GND	3.24	3.33	3.31	GND	2.59	2.69	2.67

	Q053	Q054	Q055	Q090	Q092	Q451	Q452	Q453
B	0.00	0.00	0.00	1.31	8.92	0.60	0.00	0.00
C	5.00	5.01	5.01	GND	2.37	0.00	2.49	8.66
E	2.59	2.68	2.65	2.04	4.99	GND	GND	GND

	Q501	Q505	Q520	Q551	Q605	Q606	Q820	Q830	Q2350
B	0.36	2.46	1.76	0.00	4.05	0.00	130.30	129.80	6.79
C	85.20	4.98	4.98	-25.30	0.00	3.68	0.00	127.80	GND
E	GND	2.32	1.60	GND	4.01	GND	130.70	130.40	2.35

A-BOARD WAVEFORMS -- FORMAS DE ONDA TARJETA A



Medición de Formas de Onda

1. Un símbolo como (3) indica el punto para medir una señal. (La medición puede hacerse en el punto con mayor accesibilidad, siempre que sea común al indicado.)
2. Se midieron utilizando un generador con formato NTSC conectado a la terminal de la antena. (Patrón de 8 Barras de Colores EAI, formato NTSC de 100 IREs para el Blanco y 7.5 IREs para el Negro.)
3. Los ajustes de usuario de los Menus PICTURE y AUDIO se normalizaron. Posteriormente el nivel de volumen se ajusta al mínimo.
4. Las formas de onda de Video y Color fueron tomadas con un osciloscopio de banda alta y con un punta de prueba de baja capacitancia (10 a 1). La forma y amplitud de las ondas puede variar según el tipo de osciloscopio que se utilice y sus características.
5. El símbolo de tierra ⏚ que aparece junto al número de la forma de onda, indica que se utiliza conexión a **Tierra Caliente** en el extremo negativo de la punta de prueba.

PRECAUCION: Si no se utiliza la conexión a la tierra adecuada, se obtendrán mediciones equivocadas y podría dañar el equipo de medición.

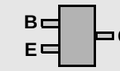
Waveform Measurements

1. (3) indicates waveform measurement. (Measurement can be taken at the best accessible location in common to the indicated point.)
2. Taken with an NTSC signal generator connected to the antenna terminal. (NTSC color bar pattern of 8 bars of EIA colors, 100 IRE white and 7.5 IRE black.)
3. Customer Controls (Picture/Audio Menu) are set to Normalize. Volume is set to "MIN".
4. All video and color waveforms are taken with a wideband scope and a probe with low capacitance (10 to 1). Shape and peak altitudes may vary depending on the type of Oscilloscope used and its settings.
5. Ground symbol ⏚ shown on waveform number indicates (Hot) ground lead connection of the Oscilloscope.

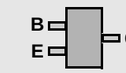
CAUTION: Incorrect ground connection of the test equipment will result in erroneous readings.

WAVEFORMS -- FORMAS DE ONDA
ALL MODELS - TODOS LOS MODELOS

CHIP TRANSISTOR LEAD DESIGNATION



IDENTIFICACIÓN DE TERMINALES PARA TRANSISTORES EN *CHIP*



NOTA DE SEGURIDAD

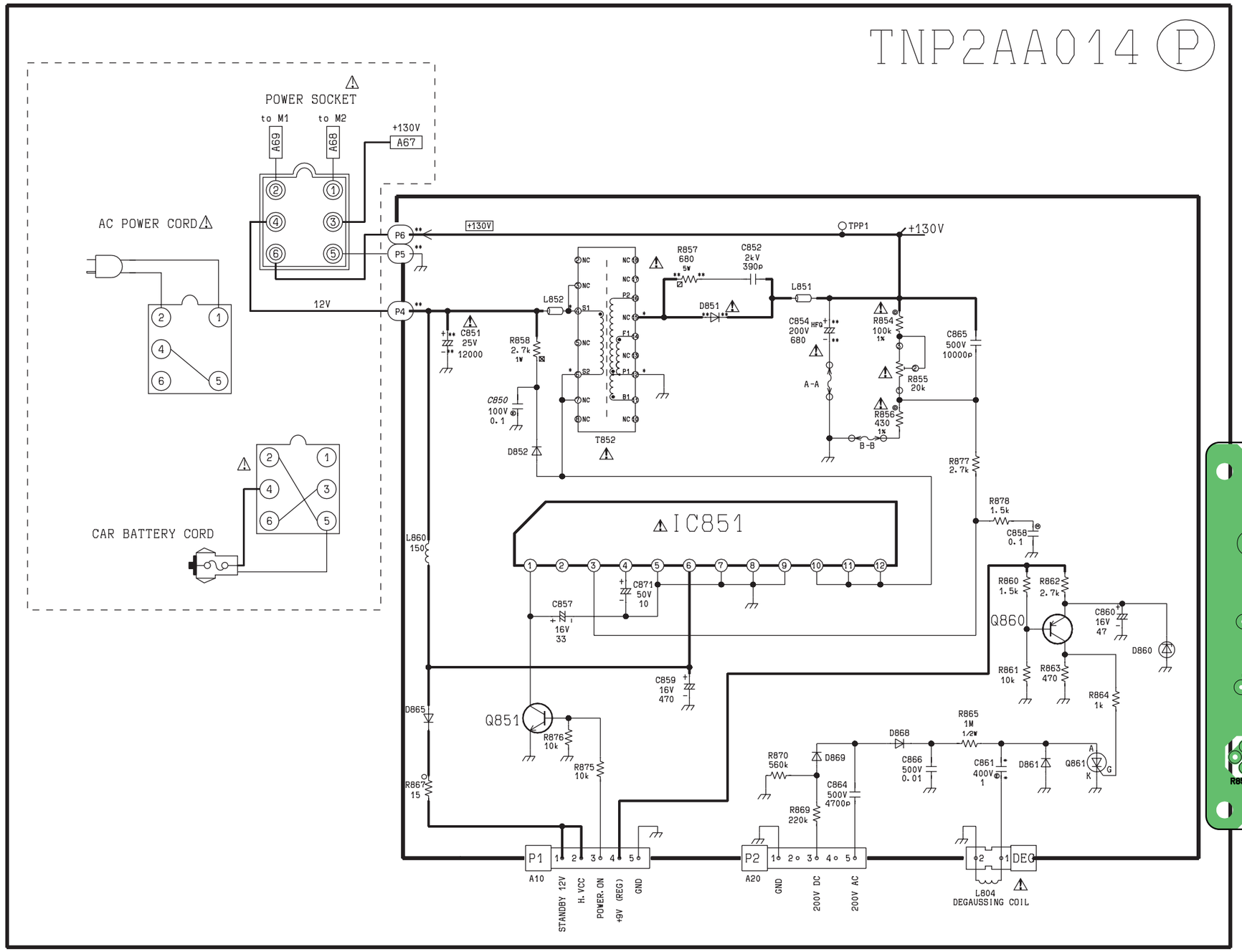
LOS DIAGRAMAS ELÉCTRICOS INCLUYEN CARACTERÍSTICAS ESPECIALES MUY IMPORTANTES PARA LA PROTECCIÓN CONTRA RAYOS-X, QUEMADURAS Y DESCARGAS ELÉCTRICAS. CUANDO SE DE SERVICIO ES IMPORTANTE USAR PARA REEMPLAZO DE COMPONENTES CRITICOS, SOLO PARTES ESPECIFICADAS POR EL FABRICANTES. LOS COMPONENTES CRITICOS ESTAN SEÑALADOS EN LOS DIAGRAMAS POR EL SIMBOLO ⚠.

IMPORTANT SAFETY NOTICE

THIS SCHEMATIC DIAGRAM INCORPORATES SPECIAL FEATURES THAT ARE IMPORTANT FOR PROTECTION FROM X-RADIATION, FIRE AND ELECTRICAL SHOCK HAZARDS. WHEN SERVICING IT IS ESSENTIAL THAT ONLY MANUFACTURERS SPECIFIED PARTS BE USED FOR THE CRITICAL COMPONENTS DESIGNATED WITH A ⚠ IN THE SCHEMATIC.

P-BOARD SCHEMATIC, LAYOUT & VOLTAGES
DIAGRAMA ELÉCTRICO, CIRCUITO IMPRESO Y VOLTAJES TARJETA P

P-BOARD - TARJETA P
CT-13R52DE

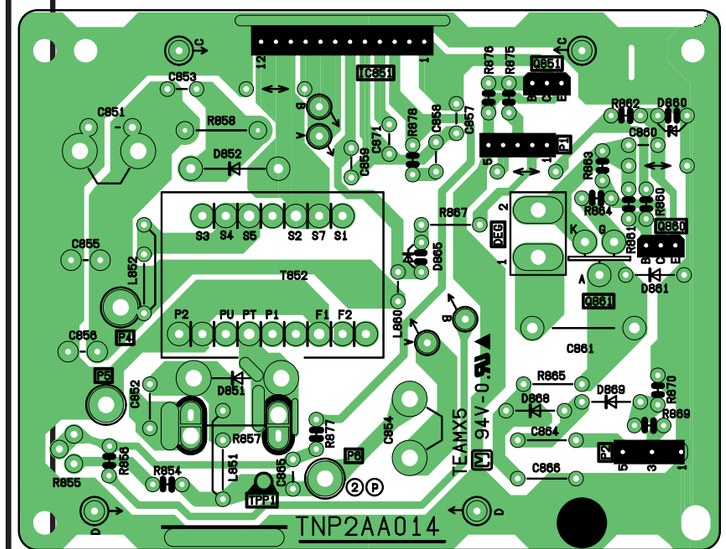


Receiver is in AC-Mode
Receptor en la modalidad AC

IC851	
1	0.00
2	n.c
3	0.00
4	0.00
5	GND
6	0.00
7	GND
8	GND
9	GND
10	0.00
11	0.00
12	0.00

	Q851	Q860
B	0.00	7.94
C	0.00	0.00
E	GND	6.18

	Q861
K	GND
A	180.00
G	GND



SERVICE MODE (ELECTRONIC CONTROL)
SERVICE ADJUSTMENT VALUES

Model _____ Ser #_____ Date_____

Note: Record the original settings PRIOR to modifying the registers.

Mode	Service Adjustment	Adjustment Range	Def. Val.	Original Value	New Value
Sub Adjustments					
B0	SUB-COLOR	0 ~ 127	33		
B1	SUB-TINT	0 ~ 127	36		
B2	SUB-BRIGHTNESS	0 ~ 255	127		
B3	SUB-CONTRAST	0 ~ 127	20		
B4	R OFFSET	N/A	0	FACTORY PRESET	
B5	YNR	N/A	0	FACTORY PRESET	
B6	YNR LIM	N/A	0	FACTORY PRESET	
Cut-Off Adjustments					
C0	CUT-OFF R	0 ~ 255 0 ~ 255	0 255		
C1	CUT-OFF G	0 ~ 255 0 ~ 255	0 255		
C2	CUT-OFF B	0 ~ 255 0 ~ 255	0 255		
C3	R DRIVE	0 ~ 127	80		
C4	G DRIVE	0 ~ 127	80		
C5	B DRIVE	0 ~ 127	80		
C6	V SIZE	0 ~ 255	127		
C7	NOT USED	--	--	NOT USED	
C8	NOT USED	--	--	NOT USED	
C9	HORIZONTAL CENTER	0 ~ 31	16		
CA	ACL	0 ~ 1	1		
CB	HHS	0 ~ 7	0		
CC	OSD SHIFT	N/A	88	FACTORY PRESET	
CD	ACL-REF	N/A	74	FACTORY PRESET	
CE	ACL-REF	N/A	64	FACTORY PRESET	
CF	ACL-REF	N/A	48	FACTORY PRESET	
C10	ACL-REF	N/A	40	FACTORY PRESET	
C11	ACL-REF	N/A	31	FACTORY PRESET	
C12	ACL-REF	N/A	20	FACTORY PRESET	
C13	ACL-COEFF	N/A	124	FACTORY PRESET	

Mode	Service Adjustment	Adjustment Range	Def. Val.	Original Value	New Value
Cut-Off Adjustments, Cont.					
C14	ACL-COEFF	N/A	117	FACTORY PRESET	
C15	ACL-COEFF	N/A	94	FACTORY PRESET	
C16	ACL-COEFF	N/A	80	FACTORY PRESET	
C17	ACL-WAIT	N/A	2	FACTORY PRESET	
C18	ACL-THRESHOLD	N/A	9	FACTORY PRESET	
C19	MACROVISION	N/A	3	FACTORY PRESET	
C1A	OSD SELECT	N/A	1	FACTORY PRESET	
C1B	KILLER ON	N/A	6	FACTORY PRESET	
C1C	KILLER OFF	N/A	20	FACTORY PRESET	
C1D	KILLER TIME	N/A	3	FACTORY PRESET	
C1E	ACC THRESHOLD	N/A	17	FACTORY PRESET	
C1F	ACC OFF	N/A	7	FACTORY PRESET	
C20	MUTE TIME	N/A	11	FACTORY PRESET	
Options Adjustments					
S0	SHARPNESS PW	N/A	3	FACTORY PRESET	
S1	SHARPNESS OW	N/A	3	FACTORY PRESET	
S2	HALFTONE	N/A	0	FACTORY PRESET	
S3	TVC DELAY	N/A	0	FACTORY PRESET	
S4	TVY DELAY	N/A	0	FACTORY PRESET	
S5	GAMMA	N/A	13	FACTORY PRESET	
S6	VIDEO Y DELAY	N/A	0	FACTORY PRESET	
S7	VIDEO C DELAY	N/A	0	FACTORY PRESET	
S8	COMB BPF	N/A	0	FACTORY PRESET	
S9	COMB 2D	N/A	1	FACTORY PRESET	
SA	COLOR KILLER LEVEL	N/A	0	FACTORY PRESET	
SB	KILLER THRESHOLD	N/A	0	FACTORY PRESET	
SC	ACC SW	N/A	0	FACTORY PRESET	
SD	ACC AMP OFF1	N/A	100	FACTORY PRESET	
SE	ACC AMP OFF2	N/A	0	FACTORY PRESET	
SF	ACC AMP ON	N/A	20	FACTORY PRESET	

SERVICE MODE, CONT. (ELECTRONIC CONTROL)
SERVICE ADJUSTMENT VALUES

Model _____ Ser #_____ Date_____

Note: Record the original settings PRIOR to modifying the registers.

Mode	Service Adjustment	Adjustment Range	Def. Val.	Original Value	New Value
Options Adjustments (Cont.)					
S10	ACC AMP CTL	N/A	3	FACTORY PRESET	
S11	BGP POSITION	N/A	21	FACTORY PRESET	
S12	OSD R	N/A	30	FACTORY PRESET	
S13	OSD G	N/A	30	FACTORY PRESET	
S14	OSD B	N/A	30	FACTORY PRESET	
S15	NOISE KILLER TIME	N/A	5	FACTORY PRESET	
S16	NOISE KILLER (ACC)	N/A	50	FACTORY PRESET	
S17	HV TIMING	N/A	2	FACTORY PRESET	
VCJ Adjustments (Black Expansion)					
P0	FORCE BS	N/A	1	FACTORY PRESET	
P1	DET ON/OFF	N/A	1	FACTORY PRESET	
P2	ROM SEL	N/A	3	FACTORY PRESET	
P3	ROM CURVE	N/A	2	FACTORY PRESET	
P4	BS ON/OFF	N/A	1	FACTORY PRESET	
P5	BS TIME CONSTNAT	N/A	5	FACTORY PRESET	
P6	THRESHOLD V	N/A	4	FACTORY PRESET	
P7	THRESHOLD F1	N/A	129	FACTORY PRESET	
P8	THRESHOLD F1	N/A	1	FACTORY PRESET	
P9	THRESHOLD OFF1 (EFFECT OFF)	N/A	35	FACTORY PRESET	
PA	THRESHOLD F2	N/A	99	FACTORY PRESET	
PB	THRESHOLD F2	N/A	1	FACTORY PRESET	
PC	THRESHOLD OFF2 (EFFECT OFF)	N/A	30	FACTORY PRESET	

Mode	Service Adjustment	Adjustment Range	Def. Val.	Original Value	New Value
VCJ Adjustments, Cont. (Black Expansion)					
PD	THRESHOLD F3	N/A	80	FACTORY PRESET	
PE	THRESHOLD F3	N/A	1	FACTORY PRESET	
PF	THRESHOLD OFF3 (EFFECT OFF)	N/A	21	FACTORY PRESET	
P10	THRESHOLD ON1	N/A	37	FACTORY PRESET	
P11	THRESHOLD ON2	N/A	33	FACTORY PRESET	
P12	THRESHOLD ON3	N/A	25	FACTORY PRESET	
P13	CURVE1	N/A	3	FACTORY PRESET	
P14	CURVE2	N/A	3	FACTORY PRESET	
P15	CURVE3	N/A	3	FACTORY PRESET	
P16	RATIO1	N/A	0	FACTORY PRESET	
P17	RATIO2	N/A	2	FACTORY PRESET	
P18	RATIO3	N/A	3	FACTORY PRESET	
Other Adjustments (With FM)					
X0	AFCT	0 ~ 127	83		
X1	AFCB	0 ~ 127	44		
X2	AFCC	0 ~ 127	64		
X3	CLOCK	0 ~ 255	128		
Other Adjustments (Without FM)					
X0	AFCT	0 ~ 127	60		
X1	AFCB	0 ~ 127	29		
X2	AFCC	0 ~ 127	42		
X3	CLOCK	0 ~ 255	128		

Note: *Some adjustments modes may not be available on all models, depending on applicability.*

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